Note on the North Polar Distance of the Star Lacaille 4342. By David Gill, Esq., H.M. Astronomer at the Cape of Good Hope.

In his Paper on the North Polar Distances of the Cape Catalogue (*Monthly Notices*, November 1881), Mr. Downing, at page 20, directs my attention to the star Lacaille 4342, pointing out a discordance of $4''\cdot69$ between its N. P. D. as given in the Cape Catalogue for 1880 and that of the Melbourne Catalogue for 1870.

The discordance, however, is capable of easy explanation—viz. a typographical error in the Melbourne Catalogue.

The mean of the separate results, as published in the annual volumes of the Melbourne Observatory, reduced to 1870, the N.P.D. of the Star in question appears to be about

$$176^\circ\ 16'\ 38''\cdot8,$$

not

$$176^\circ\ 16'\ 33''\cdot8,$$

as printed.

The place of the Cape Catalogue reduced to 1870 is

$$176^\circ\ 16'\ 38''\cdot5,$$

a sufficiently satisfactory agreement.

Note on the Places of Three Stars in the Armagh Catalogue. By Rev. T. R. Robinson.

Dr. Robinson's attention has been called (by M. L. Schulhof, of Paris) to three stars in this Catalogue of which the places appeared to be affected with errors.

On re-examining the observations and reductions, he finds this to be the case.

A 1435: the A.R. and N.P.D. given there belong to different stars—the A.R. to P. vi. 61; the N.P.D. to P. 55, and when properly reduced becomes N.P.D. $31^\circ\ 20'\ 54''\cdot87$.

A 1437: N.P.D. should be $31^\circ\ 30'\ 20''\cdot53$.

A 2076: N.P.D. should be $90^\circ\ 46'\ 31''\cdot86$.

A New Method of Bright-wire Illumination for Position Micrometers. By S. W. Burnham, Esq.

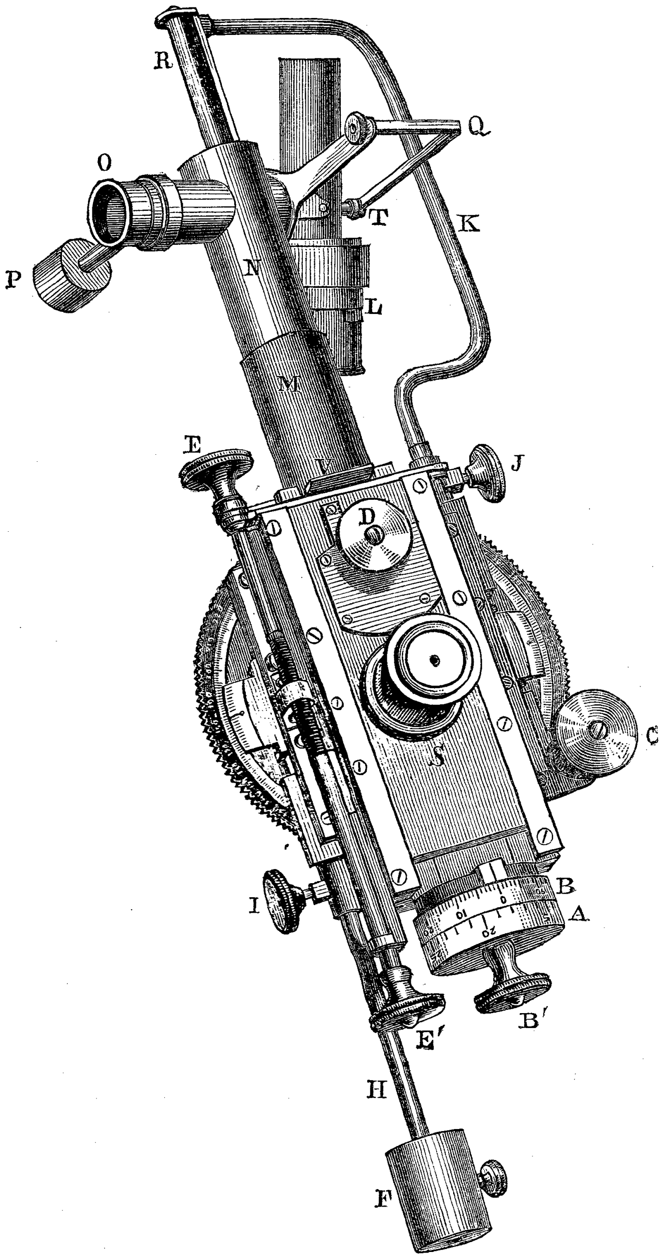
In all my double-star measures I have uniformly used a bright-wire illumination, that method having been found by experience to be much superior to any form of bright field, and

particularly in the observation of very close pairs and very faint companions which could only be seen with difficulty without any illumination at all. The Fraunhofer plan (which seems to have been the best in general use), of attaching the lamp to a hollow arm forming an angle of about 45° with the axis of the telescope, was always very objectionable and inconvenient, from the fact that to obtain a proper light on the wires it was necessary to change the place of the lamp with every change of the wires in position-angle, so as to allow the light to strike the wires approximately at right angles. For some years past I have given much attention, and made many experiments, with a view to the improvement of the micrometer in this respect. This resulted, while at the Washington Observatory during the summer of 1881, in the execution of a plan for the "end" illumination of the Clark micrometer attached to the $15\frac{1}{2}$-inch Refractor of that Observatory. That device was fully described and illustrated in the *English Mechanic* for September 16, 1881. This micrometer was regularly used for some months, and although the illuminating apparatus was somewhat roughly made, and intended only to demonstrate the practical success of this device, it was found to work so satisfactorily in every respect that the micrometer for the 12-inch Refractor of the Lick Observatory was constructed after the same plan, and was used by the writer for some weeks on Mount Hamilton, Cal., in the latter part of 1881. This illuminating apparatus is identical in principle with that previously described, but, as would be expected from the great skill and ingenuity of the firm of Alvan Clark & Sons, by whom it was made, the mechanical construction generally is vastly improved, and the convenience and usefulness of the micrometer increased thereby.

The accompanying illustration is engraved from a photograph of the Lick Observatory micrometer, the construction of which will be understood by a brief description.

The micrometer is of the usual form made by the Clarks, B being the graduated head of the micrometer-screw, and A another graduated head turning on the same axis for giving the whole revolutions of the screw; C is the head of a pinion attached to the plate under the micrometer-box, and gearing into the teeth of the rigid circular plate containing the position circle, for moving the wires in position angle; D is the head of another small pinion for sliding the eyepiece over the wires; E E′ are heads of the bisecting-screw for moving the whole system of wires and the box S in a direction parallel to the micrometer-screw, and at right angles to the wires. The light from the lamp L is reflected by a mirror in N, and passes down that tube and through M, and then through a hole in the end of the box to the wires. A condensing lens is placed in N, for the purpose of concentrating the light on the wires. On the opposite side of the wires, towards the micrometer head, a small reflector is placed which reflects the light back, thereby symmetrically illu-

minating the wires on both sides. The lamp swings freely on its axis in the line of OT, but always maintains a vertical position, whatever may be the direction of the wires or the pointing of the telescope. The tube N, with the lamp and its



attachments, has an axle R supported by the fixed arm K. The bearings T, and axle of the lamp, are kept always horizontal by the weight of the counterpoise P. The tube M is fixed to the micrometer box, and projects loosely over N far enough to allow

for the necessary movement of the box by the bisecting-screw E. The supporting arm K is attached by the set-screw J, not to the box, but to the plate underneath it, so that the weight moved by the bisecting-screw is not increased at all by the illuminating apparatus. Attached to the same plate, on the opposite side by a set-screw I, is the rod H, bent so as to be thrown forward out of the way of E′ and B, with a weight F to balance the weight of the lamp attachments. The whole device can be instantly detached when desired, by loosening the screws I and J. In the tube M is a slot V, in which is placed a slip of red or other coloured glass, held in any desired place by a light spring pressing against it. All or any part of the light can be made to pass through the coloured medium. The mirror in N is attached to a tube which slides into the tube O. By turning this tube by the milled edge projecting at O, the inclination of the mirror may be varied to any extent, and the light reduced from the maximum amount until the wires become invisible. By turning the mirror 90° or more the light is entirely shut off. It will be seen that the lamp can revolve freely through the bent arm Q; and the whole moveable part of the device, lamp, arm Q, and counterpoise P, can turn through the supporting arm K, the lamp at all times remaining vertical, and in exactly the same position with respect to the wires. It might at first be supposed that the lamp, or some of the parts, would be in the way of the observer. I have never found it so in practice, and, although it is but a few seconds' work to either attach or detach it, I have very rarely removed it, whatever might have been the use of the telescope at the time.

It is important to preserve the relative positions of the micrometer-head, bisecting-screw, and pinion C, as here shown. No other arrangement will be as convenient. In every possible position of the micrometer, the necessary use of both hands at the same time will be found to be convenient and easy for the observer. Naturally the more delicate motions of the micrometer-screw and the pinion will be effected by the right hand, and the corresponding movement of the bisecting-screw by the left hand. When the micrometer box is anywhere near a horizontal position with respect to the observer (the wires at right angles to the line joining the eyes) C and E are used by the right and left hands respectively in measuring angles, and B′ and E in measuring distances. When the box is more nearly vertical with respect to the observer, the head E′ of the bisecting-screw will be worked by the left hand in each case. The convenience and practical value of this arrangement can only be appreciated by one who has used the old plans, and then tried this.

With respect to the practical working of the illumination, I will briefly say that it has proved a complete success in every respect. Any object that can be seen under any circumstances, however faint, can be well and accurately measured. There is no such thing as a star too faint for measurement, if it can be

seen at all. A very feeble light is sufficient to illuminate the wires perfectly for any object. I believe far better results can be obtained by the use of bright wires in a large part of the most desirable and important double-star work, than is possible by the same observer using a bright field, and that sooner or later it will be generally used in all micrometrical observations.

Chicago:
1882, *February* 25.

The Transit of Mercury, 1881, *November* 7, *observed in New South Wales.*

(*Communicated by H. C. Russell, Esq., Government Astronomer, Sydney.*)

In order to secure satisfactory observations of the Transit of *Mercury* the observers were divided into three parties: two, Mr. Lenehan, first assistant in the Observatory, and myself, observed at Sydney, using respectively $7\frac{1}{4}$-inch and $11\frac{1}{2}$-inch Refractors, both stopped to 6 inches. At Katoomba, a place on the Western Railway, 66 miles west of Sydney, and 3,400 feet above the sea level, Messrs. Hargrave and Bladen, assistants in the Observatory, observed; the former using a $4\frac{3}{4}$-inch Troughton & Simms equatoreally-mounted Refractor, and the latter a $4\frac{1}{4}$-inch Cooke Equatoreal, both driven by clock-work. At Bathurst, on the elevated table land, 2,300 feet above the sea and 134 miles by rail west of Sydney, the observers were Mr. Conder, chief of the Trigonometrical Branch of the Survey Department, and Mr. Brooks, on the Trigonometrical Survey staff; the former used a $4\frac{3}{4}$-inch Schroeder Equatoreal, and the latter a $3\frac{3}{4}$-inch Troughton & Simms.

The morning was fine and clear, but the definition in Sydney was very bad; on the high lands it was better. At Egress, the definition in Sydney was steadier, but a thick cirrus haze covered the sky; the conditions were similar at the inland stations, only the definition got worse instead of better.

The times given are all in Sydney mean time, and corrected for clock errors, but not for the positions of the observers. The following extracts from the observers' Reports will show the phenomena observed:—

Mr. Russell: "For *Ingress*, used $7\frac{1}{4}$-inch Merz Refractor, power 150.

"Air clear, but very unsteady. $8^h\ 21^m\ 34^s{\cdot}64$, thought I saw notch in Sun's limb, but lost it. $8^h\ 21^m\ 44^s{\cdot}64$, first contact certain. $8^h\ 23^m\ 5^s$, *Mercury* assumed a D shape; Sun's limb boiling, and *Mercury* seems to jump half its diameter. $8^h\ 23^m\ 39^s{\cdot}14$, observed unsatisfactory contact—unsatisfactory, because of the vibration and tremulous definition, and that, for ten seconds be-